DEVELOPMENT OF ECONOMICAL AND ENERGY EFFICIENT POLLUTANT MONITORING SYSTEM A STEP TOWARDS HEALTHY ENVIRONMENT, IMPLEMENTED IN LABVIEW

Mr. J. V. Patil | Dr. S. R. Patil | Miss. P. N. Kajave

ABSTRACT

Today it is widely accepted that human activities are responsible for high level of pollution and climate change. The main source of greenhouse gas emission is fossil fuels which leads to major greenhouse pollutants which includes,CO_2, CO, SOx, NOx , suspended particulate matter (SPM), Lead aerosol, volatile organic compounds, and other toxics. These chemicals are responsible for disease like lung cancer, pneumonia, asthma, chronic bronchitis, coronary artery disease, and chronic pulmonary disease. To reduce greenhouse gas emissions and to provide better environment it becomes necessity that pollutant in environment should be continuously monitored. Environment has become an important area of research because of its influence on human health, Hence there is a growing demand for Pollutant Monitoring System. In view of ever increasing pollution sources with toxic chemicals, this system will have the facilities to detect and quantify the sources of pollution rapidly.

KEYWORDS: Environment, Energy Effcient, LabVIEW, Monitoring, Pollutants, PMS (Pollutant Monitoring System), Sensors.

1. INTRODUCTION

ENERGY and efficiency have now become an important concern for sustained growth and overall de-velopment. For a developing country like India, the situation is further grieved because major part of energy, to drive the economy, is imported [3]. Today it is widely ac-cepted that human activities are responsible for high level of pollution and climate change. According to the Fifth Intergovernmental Panel on Climate Change (IPCC) is now 95 percent certain that humans are the main cause of current global warming, both in developed and develop-ing countries [5].

The main source of greenhouse gas emission is fossil fuels which leads to major greenhouse pollutants which includes,CO_2, CO, SOx, NOx , suspended particulate matter (SPM), Lead aerosol, volatile organic com-pounds, and other toxics . From different studies, it is well revealed that when human beings come in contact these chemicals/pollutants have adverse effect on human health. These chemicals are responsible for disease like lung cancer, pneumonia, asthma, chronic bronchitis, cor-onary artery disease, and chronic pulmonary disease. To reduce greenhouse gas emissions and to provide better environment it becomes necessity that pollutant in envi-ronment should be continuously monitored. Study shows that by constant monitoring and using commercially available technologies, it is possible to reduce carbon emissions by 60% or more, which translates to 1.35 bil-lion tons of carbon [4].

Environment has become an important area of research because of its influence on human health, Hence there is a growing demand for Pollutant Monitoring Sys-tem. In view of ever increasing pollution sources with tox-ic chemicals, this system will have the facilities to detect and quantify the sources of pollution rap-idly. In this pro-ject, a Pollutant Monitoring System will be developed which will give results with scientifically acceptable accu-racy. It has added advantages such as portability, low cost, fast response time, easy to operate, and low-power consumption.

2. EXISTING TECHNIQUES

FanZhang, JingwenTian[2008][1]: This sysem deals with the flexible and self-organizing wireless mesh network which is used to achieve the real time acquisition and multi-hop wireless communication for parameters monitoring of atmospheric environment such as SO2, NO2, NO, temperature, humidity and air pressure, etc. The network structure of the system is established by the hardware architecture of the system designed. The entire monitoring system can be quickly arranged and station has a strong self-healing capability and network robust-ness and can be used for a variety of occasional atmos-pheric environmental monitoring.

Hu Jianbin, Zhang Xiaoli , Wang Hairan [2010][2]: This scheme of design and implementation of indoor environmental monitoring system based on JN5139 SOC. The system takes full advantages of ZigBee technology of JN5139 SOC chip in wireless sensor net-work design and implementation to realize the hardware design of wireless sensor nodes and construct Mesh-type sensor network using JENNIC ZigBee protocol stack. Based on above design, PC monitoring control terminal is expanded so as to realize the configuration of operation mode of sensor networks and sensor nodes. The test results show that the proposed system realizes the accurate moni-toring of indoor environmental quality parameters such as temperature and humidity, density of carbon dioxide.

Anuj Kumar, I. P. Singh, and S. K. Sud [2011][3]: In this Indoor Environment Monitoring System (IEMS) for monitoring the concentrations of indoor air pollutant gases and indoor environmental parameters has been developed in compliance with IEEE1451.2 standard. The sensor array is implemented using the electrochemi-cal sensors. The smart transducer interface module (STIM) is implemented using the microcontroller. Net-work Capable Application Processor (NCAP) implement-ed in LabVIEW 9.0 is based on the IEEE 1451.1 stand-ard. The NCAP is connected to the STIM via a USB 2.0 Transducer In- dependent Interface. The level of indoor environment parameters and information regarding the STIM can be seen on the graphical user interface (GUI) of the NCAP. Sensors are recalibrated using the potentiome-ter adjustment technique of signal conditioning circuits. The IEMS is low cost, energy efficient, and porta-ble.

Anuj Kumar, Hiesik Kim, and Gerhard P. Hancke[2013][4]: In this techniques of environmental monitoring (EM) systems and what is required for the variations in hardware implementation and/or algorith-mic logic. The environmental monitoring systems and is mainly focused on energy-efficient and low-cost environment monitoring systems. The following are some of the major factors that usually rule the development of EM systems, namely, energy efficiency, cost of the overall sys-tem, response time of the sensor module, good accuracy of the system, adequate signal-to-noise ratio, radio frequency interference/electromagnetic interference (RFI/EMI) rejec-tion during varying atmospheric conditions and in in-homogeneous environments, a user friendly interface with the computer, and complexity of computation. Emphasis is on the necessity of robust systems that address all or most of the above mentioned criteria.

3. PROBLEM DEFINING

The Air Pollutant gases are increasing day by day which leads to a great threat to mankind as well as environment. So to reduce this greenhouse gases emission and provide better environment it has become a necessity that environment should be monitored continuously and major steps to be implemented to control the sources of emission of such gasses.

Now a day's all countries in the world are work-ing on clean environment, On 2nd October 2014, Gov-ernment of India has launched "Swachh Bharat Abhi-yan" (Clean India Mission), The proposed system takes one step towards it by developing a economical and ener-gy efficient Pollutant Monitoring System, that will help in Monitoring the concentration of pollutant in environ-ment with the help of Lab VIEW.

4. OBJECTIVES

1. The prime aim is to develop a Pollutant Monitoring Sys-tem (PMS) which can detect the concentration of hazard-ous pollutant present in the environ-ment.

2. The developed system which is small in size and hence portable in nature.

3. As the system consumes less power it is energy efficient.

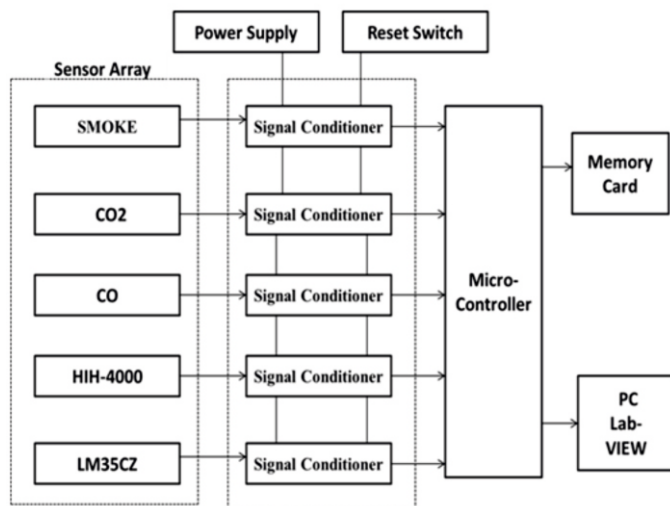4. It is Economical due to circuitry involved is less.

5. OUR CONIBUATION

Based on the above literature all methods are based on the environmental monitoring (EM) systems are not specific to pollutant monitoring.

The above mentioned system inspires me to make an at-tempt to redesign the existing system and develop a pollu-tant monitoring system which is economical and energy ef-ficient to monitor the environmental pollutant.

The proposed system includes Pollutant sensors ,temperature sensor, humidity sensor ,PIC microcontroller and monitored on LabVIEW.

Developing such system will help in Domestic and Offi-cial Workplace in metro cities, Hospitals and Food storage warehouses etc.

5.1 BLOCK DIAGRAM:

5.2 DESCRIPTION OF BLOCK DIAGRAM

• **Sensor Array:**

It consists of Smoke, Carbon dioxide, Carbon monoxide, Temperature and Humidity sensor, which are electrochemical sensor. Electrochemical sensors operate by reacting with the gas of interest and producing an electri-cal signal proportional to the gas concentration. The elec-trical signal produced are weak and in analog form.

• **Signal Conditioning and Amplifier:**

The produced signal by Sensor array is analog in nature and weak in strength.

The Signal conditioner block consists of Analog to Digital Converter and the weak signal is amplified with the help of amplifier. It is equipped with Power Supply Unit and Reset Switch.

• **Microcontroller:**

It collects the conditioned data, which is now digital and amplified in nature from the Signal Condition-ing and Amplifier block. A microcontroller has been cho-sen to develop the Smart Transducer interface module (STIM), and to transfer the data to PC for monitoring purpose. A Memory Card is used to store the data.

• **LabVIEW:**

This is the virtual part of the system as it is the part in which data collected by the microcontroller is moni-tored on the PC with the help of LabVIEW Software.

6. CONCLUSION

• The pollution has become a major problem in both developed and developing countries, therefore it is need of time to detect and monitor the harmful pollutants in the environment.

• The proposed system enables us to detect the harmful pollutants and its concentration in the environment, so that the sources producing it can be reduced to a large extent.

• Now a days there are various health related prob-lems which are due to hazardous gases in atmos-phere which can be monitored by the system.

• Proposed system can be used in metro cities in domestic as well as workplaces to monitor pollu-tant, so that Air Filters can be installed if the per-centage of pollutants is large.

• It can also be used in Hospitals, Food Processing industries, Warehouses etc.

• It can also be used for Chemical industries to monitor the various gases concentration.

7. REFERENCES:

1. Fan Zhang ; JingwenTian , "Environmental Monitor-ing System with Wireless Mesh Network Based on Embed-ded System", DOI: 10.1109/SEC.2008.28, Publisher: IEEE, Oct. 2008.

2. Hu Jianbin ; Zhang Xiaoli ; Wang Hairan, "Design and implementation of indoor moni-toring wireless sensor networks based on JN5139", DOI:10.1109/ICACTE.2010.5579495,Publisher:IEEE,Aug 2010.

3. Anuj Kumar; I. P. Singh; S. K. Sud, "Energy Efficient and Low-Cost Indoor Environ-ment Monitoring System Based on the IEEE 1451 Standard", IEEE Sensors Journal, Vol. 11, No. 10, Oct 2011.

4. Anuj Kumar; Hiesik Kim; Gerhard P. Hancke, "Envi-ronmental Monitoring Systems: A Review", IEEE Sensors Journal, Vol. 13, No. 4, April 2013.

5. R.K. Pachauri; L.A. Meyer, IPCC, 2014: Climate Change 2014: Synthesis Report. Con-tribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergov-ernmental Panel on Climate Change. IPCC, Ge-neva, Switzerland, 151 pp.